

CLAIMS

1. Apparatus for monitoring liquid flow including:
 - a) a generally elongate housing having first and second ends having formed therein a liquid inlet and outlet, respectively, for permitting a liquid flow through said elongate housing, wherein said elongate housing has a cross-sectional profile which varies along the length of said elongate housing so as to impart predetermined flow characteristics to a liquid flowing therethrough; and
 - b) a flow rate indicator float disposed within said elongate housing operative to be displaced therealong in accordance with a liquid flow rate therethrough; and
 - c) flow rate indicator means associated with said flow rate indicator float, for providing a position-related indication of the rate of liquid flow through said elongate housing.
2. Apparatus for monitoring liquid flow according to claim 1, wherein at least one portion of said elongate housing is formed having a conical-shaped internal surface.
3. Apparatus for monitoring liquid flow according to claim 1, wherein said elongate housing is formed having a first housing portion having a conical-shaped internal surface and a second housing portion having a cylindrical internal surface thereby providing for an increased liquid flow therethrough.
4. Apparatus for monitoring liquid flow according to claim 1, wherein said elongate housing includes a side-wall

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having a generally cylindrical configuration and a longitudinal axis and having at least one diametric slot formed within and along said longitudinal axis, wherein said slot has a predetermined lateral width and has a diametric width which varies along said longitudinal axis, thereby imparting to said elongate housing a varying cross-sectional area accordingly.

5. Apparatus for monitoring liquid flow according to claim 1, wherein said elongate housing includes a plurality of internally stepped housing portions thereby imparting to said elongate housing a varying cross-sectional area accordingly.
6. Apparatus for monitoring liquid flow according to claim 1, wherein at least one of said first and second ends of said elongate housing has internal recesses formed therein concentric with said inlet and outlet so as to provide a valve seat for operationally engaging said flow rate indicator float thereby closing off liquid flow through said elongate housing.
7. Apparatus for monitoring liquid flow according to claim 1, wherein said flow rate indicator float is generally cylindrical having integral first and second end walls.
8. Apparatus for monitoring liquid flow according to claim 7, wherein said at least one of said first and said second end walls is formed having a conical protrusion formed concentrically therewith for operationally engaging said internal recesses formed in said first and second ends of said elongate housing thereby closing off liquid flow therethrough.

9. Apparatus for monitoring liquid flow according to claim 1, wherein said flow rate indicator float is formed having a plurality of projections protruding generally radially therefrom thereby reducing contact of said flow rate indicator float with said elongate housing.
10. Apparatus for monitoring liquid flow according to claim 1, wherein said flow rate indicator float is spherical.
11. Apparatus for monitoring liquid flow according to claim 1, wherein said elongate housing includes a housing bypass channel in operative association with a valve member for providing a liquid flow to bypass said flow rate indicator float.
12. Apparatus for monitoring liquid flow according to claim 1, wherein said flow rate indicator float is formed having a hollow therein so as to entrap gas therein, thereby increasing the buoyancy thereof.
13. Apparatus for monitoring liquid flow according to claim 1, wherein said flow rate indicator float includes apparatus for providing remote signals indicative of the displacements of said flow rate indicator float in relation to said flow rate indicator means and thereby of the liquid flow through said elongate housing.
14. Apparatus for monitoring liquid flow according to claim 13, wherein the apparatus for providing remote signals indicative of the displacement of said flow

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rate indicator float further provides visual and/or audible alerts whenever the flow rate indicated by said flow rate indicator is not within a predefined flow rate range.

15. Apparatus for monitoring liquid flow according to claim 1, further comprising a filter chamber at the lower end of the elongate housing and in liquid communication with the liquid outlet, wherein said chamber comprises a filter disposed therein such that fluids passing therethrough are filtered via said filter, and wherein entrance of air bubbles from said filter into the elongate housing is blocked in said chamber.

16. Apparatus for monitoring liquid flow according to claim 15, wherein the filter chamber is partitioned into sections that are used for trapping the air bubbles.

17. Apparatus for monitoring liquid flow according to claim 1, further comprising a filter chamber at the upper end of the elongate housing and in liquid communication with the liquid inlet, wherein said chamber comprises a filter disposed therein such that fluids passing therethrough are filtered via said filter.

18. Intravenous therapy apparatus including:

- a) at least one source of intravenous liquid;
- b) a supply tube apparatus arranged in liquid flow communication with said at least one source of

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- intravenous liquid and including at least one flow regulating valve;
- c) intravenous insertion member associated in liquid flow communication with said supply tube apparatus; and
 - d) at least one apparatus for monitoring liquid flow connected in liquid flow communication with said supply tube apparatus and including:
 - i) a generally elongate housing having first and second ends having formed therein a liquid inlet and outlet, respectively, for permitting a liquid flow through said elongate housing, wherein said elongate housing has a cross-sectional profile which varies along the length of said elongate housing so as to impart predetermined flow characteristics to a liquid flowing therethrough;
 - ii) a flow rate indicator float disposed within said elongate housing operative to be displaced therealong in accordance with a liquid flow rate therethrough; and
 - iii) flow rate indicator means associated with said flow rate indicator float, for providing a position-related indication of the rate of liquid flow through said elongate housing.

19. Intravenous therapy apparatus according to claim 18, wherein at least one portion of said elongate housing of said apparatus for monitoring liquid flow is formed having a conical-shaped internal surface.

20. Intravenous therapy apparatus according to claim 18, wherein said elongate housing of said apparatus for monitoring liquid flow is formed having a first housing portion having a conical-shaped internal surface and a

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second housing portion having a cylindrical internal surface thereby providing for an increased liquid flow therethrough.

21. Intravenous therapy apparatus according to claim 18, wherein said elongate housing of said apparatus for monitoring liquid flow includes a side-wall having a generally cylindrical configuration and a longitudinal axis and having at least one diametric slot formed within and along said longitudinal axis, wherein said slot has a predetermined lateral width and has a diametric width which varies along said longitudinal axis, thereby imparting to said elongate housing a varying cross-sectional area accordingly.
22. Intravenous therapy apparatus according to claim 18, wherein said elongate housing of said apparatus for monitoring liquid flow includes a plurality of internally stepped housing portions thereby imparting to said elongate housing a varying cross-sectional area accordingly.
23. Intravenous therapy apparatus according to claim 18, wherein at least one of said first and second ends of said elongate housing of said apparatus for monitoring liquid flow has internal recesses formed therein concentric with said inlet and outlet so as to provide a valve seat for operationally engaging said flow rate indicator float thereby closing off liquid flow through said elongate housing.
24. Intravenous therapy apparatus according to claim 18, wherein said flow rate indicator float of said

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apparatus for monitoring liquid flow is generally cylindrical having integral first and second end walls.

25. Apparatus for monitoring liquid flow according to claim 24, wherein said at least one of said first and said second end walls is formed having a conical protrusion formed concentrically therewith for operationally engaging said internal recesses formed in said first and second ends of said elongate housing thereby closing off liquid flow therethrough.
26. Intravenous therapy apparatus according to claim 18, wherein said flow rate indicator float of said apparatus for monitoring liquid flow is formed having a plurality of projections protruding generally radially therefrom thereby reducing contact of said flow rate indicator float with said elongate housing.
27. Intravenous therapy apparatus according to claim 18, wherein said flow rate indicator float of said apparatus for monitoring liquid flow is spherical.
28. Intravenous therapy apparatus according to claim 18, wherein said elongate housing of said apparatus for monitoring liquid flow includes a housing bypass channel in operative association with a valve member for providing a liquid flow to bypass said flow rate indicator float.
29. Intravenous therapy apparatus according to claim 18, wherein said flow rate indicator float of said apparatus for monitoring liquid flow is formed having a

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hollow therein so as to entrap gas therein, thereby increasing the buoyancy thereof.

30. Intravenous therapy apparatus according to claim 18, wherein said flow rate indicator float of said apparatus for monitoring liquid flow includes apparatus for providing remote signals indicative of the displacements of said flow rate indicator float in relation to said flow rate indicator means and thereby of the liquid flow through said elongate housing.
31. Intravenous therapy apparatus according to claim 30, wherein the apparatus for providing remote signals indicative of the displacement of said flow rate indicator float further provides visual and/or audible alerts whenever the flow rate indicated by said flow rate indicator is not within a predefined flow rate range.
32. Intravenous therapy apparatus according to claim 18, further comprising a filter chamber at the lower end of the elongate housing and in liquid communication with the liquid outlet, wherein said chamber comprises a filter disposed therein such that fluids passing therethrough are filtered via said filter, and wherein entrance of air bubbles from said filter into the elongate housing is blocked in said chamber.
33. Intravenous therapy apparatus according to claim 32, wherein the filter chamber is partitioned into sections for trapping the air bubbles.

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34. Apparatus for monitoring liquid flow according to claim 18, further comprising a filter chamber at the upper end of the elongate housing and in liquid communication with the liquid inlet, wherein said chamber comprises a filter disposed therein such that fluids passing therethrough are filtered via said filter.
35. A method for monitoring a liquid flow rate through an intravenous therapy apparatus, including the steps of:
- a) providing a liquid flow monitoring apparatus, including flow rate indicator means having a flow rate indicator float, in liquid flow association with an intravenous therapy apparatus;
 - b) purging air from the liquid flow monitoring apparatus by causing liquid to flow from a liquid supply member into a liquid inlet of the intravenous therapy apparatus and therethrough;
 - c) preselecting a rate of flow of liquid through the intravenous therapy apparatus;
 - d) providing a visual indication of the rate of liquid flow through the liquid flow monitoring apparatus as indicated on the flow rate indicator means, by linear displacement of the flow rate indicator float;
 - e) selectively adjusting the rate of liquid flow through the intravenous therapy apparatus;
 - f) visually inspecting the position of the flow rate indicator float against the flow rate indicator means; and
 - g) associating the position of the flow rate indicator float in the flow rate indicator means with the rate of liquid flow through the intravenous therapy apparatus.

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36. The method according to claim 31 further including, following said step b), the step of repeating the purging of air from the flow monitoring apparatus.